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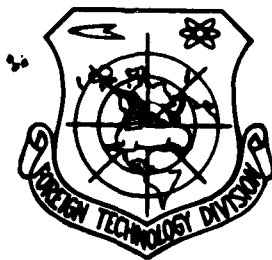
## FOREIGN TECHNOLOGY DIVISION



STUDYING THE EFFECT OF AN AzNII-10 ADMIXTURE ON  
STABILITY AND ANTIWEAR PROPERTIES OF OILS

by

A. M. Kuliyeu, I. M. Orudzheva,  
and P. S. Mamedova



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## UNEDITED ROUGH DRAFT TRANSLATION

STUDYING THE EFFECT OF AN AzNII-10 ADMIXTURE  
ON STABILITY AND ANTIWEAR PROPERTIES OF OILS

By: A. M. Kuliyeu, I. M. Orudzheva, and  
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**ABSTRACT:** The additive AzNII-10, a product of the condensation of 2,2'-dihydroxy-5,5'-di-tert-amylphenyl-sulfide with di-tert-amylphenyl-sulfide with di-tert-amylphenoxy the phosphoryl chloride improves by 10% the stability and the antiwear and tear properties of aircraft motor transformer, diesel and synthetic oils.  
English translation: 5 pages.

STUDYING THE EFFECT OF AN AzNII-10 ADMIXTURE ON STABILITY  
AND ANTIWEAR PROPERTIES OF OILS

A. M. Kuliyeu, I. M. Orudzheva,  
and P. S. Mamedova

Sulfur-and phosphorus containing compounds found broad application in role of admixtures to oils. Admixtures, containing phosphorus in its composition, possess the ability of raising stability, to improve the lubricating and other properties of lubrication oils.

In direction of synthesizing sulfur-and phosphorus containing compounds many investigations have been carried out by Soviet scientists.

A majority of sulfur-and phosphorus containing compounds appears to be reaction products of alcohols and alkylphenols with pentasulfuric phosphorus [1, 2, 3].

Our task was to obtain an admixture for the purpose of approving the exploitation properties of special petroleum and synthetic oils.

For that purpose was synthesized a new [AzNII-10] (AzHMM-10) admixture, representing a condensation product of sulfidealkylphenol with chloroanhydride of alkylphenolphosphoric acid [4].

To obtain an AzNII-10 admixture was used para-tertiary amyphenol, synthesized by alkylation of phenol with iso-amy alcohol in the presence of 98%-sulfuric acid.

Alkylphenol after flushing to neutral reaction was subjected to recrystallization in a dearomatized ligroin solution at a temperature of 0°C. With the use of para-tertiary amyphenol were synthesized 1.1' dioxy-4.4' ditertiaryamy-diphenyl-2.2' sulfide and di'tertiary amyphenoxychloroanhydride phosphorous acid.

Table 1. Results of Testing Oils with Admixtures on a Fourball Apparatus

Name of oils	Name of admixtures	Amount of admixture %	Value of maximum load $P_k$	Pressure on lubrication film at moment of applying load equal $P_k$ , $P_m$	Strength value of film $kg/mm^2$
Aviation oil MK-22	—	—	57	25700	16100
The same	AzHII-10	3	107	31800	18100
Aviation oil MC-20	—	—	54	25300	13400
The same	AzHII-10	3	121	33100	20100
Aviation oil MK-8	—	—	31	21100	10150
The same	AzHII-10	0.5	134	26200	18200
The same	Hexachloroethane	5	83	29000	18100
The same	Trichlorocresylphosphite	5	83	29000	13300
The same	HAMI-117	5	89	29000	13300
Synthetic oil 36/1	—	—	70	21100	10850
The same	AzHII-10	3	108	24400	18000
The same	The same	0.5	108	24400	18000

By condensation of these compounds was obtained an AzNII-10 admixture.

An analysis of para-tertiary amyphenol, intermediate synthesis products and AzNII-10 admixture has shown, that these compounds are individual products.

Investigations have shown, that the AzNII-10 admixture dissolves well in less viscous deeply purified petroleum, as well as synthetic oils. It was also established, that the AzNII-10 admixture exerts a slight effect on the physico-chemical properties of oils.

Investigated was the effect of AzNII-10 admixture on antiwear properties of oils, as well as on stability.

For investigation were taken oils - aviation [MK-8] (MK-8), [MS-20] (MC-20) and MK-22, transformer, diesel, as well as synthetic oils.

Table 2. Effect of AzNII-10 Admixture on Stability of Transformer Oil when Testing by VTI Method (Oxidation of Air)

Name of product	Amount of admixture, %	Analysis of oxidized oil	
		Acid number mg KOH	Residue %
at 120°C			
Transformer oil		0.18	0.075
The same + addition AzHMM-10	0.05	0.06	0.021
	0.10	0.01	0.024
	0.3	0.22	0.05
The same + addition ionol	0.3	0.01	0.012
The same + addition paraoxidesphenolamines	0.02	0.07	0.04
at 150°C			
Transformer oil		0.98	1.20
The same + admixture AzHMM-10	0.1	1.02	0.85
	0.3	0.13	0.28
The same + admixture ionol	0.5	0.37	0.35
at 170°C			
Transformer oil		3.86	2.57
The same + admixture AzHMM-10	0.3	1.45	1.00
The same + admixture ionol	0.5	3.39	2.48

In Tables 1, 2, 3, and 4 are given results of testing oils with an AzNII-10 admixture. The stability of the oils was determined by the [VTI] (BTM) and AzNII method.

The data in Table 1 show, that at the addition to oils of AzNII-10 admixture in amount of 0.5% considerably improve their antiwear properties.

Examining the data, given in Tables 2, 3, and 4 it can be seen, that the AzNII-10 admixture raises the stability of transformer oil, diesel oil, and synthetic oils.

The AzNII-10 admixture exerts a positive effect on the stability of transformer oil during oxidation at a temperature of 120°C and over.

The addition of AzNII-10 admixture to oil, containing AzNII-7 and [SB-3] (CB-3) admixtures does favorably affect the stability of this oil.

Data in Table 4 show, that synthetic oils with an AzNII-10 admixture possess fine anticorrosion and antiscale properties.

Table 3. Stability of Diesel Oil in Mixture with Admixtures.

Name of product	Amount of admixture %	Analysis of oil oxidized by method BTM (160°C 14 hours)		Results of oxidation by by АЗННН method, min	
		Acid number, mg KOH	Residue %	Induction period	Time of absorbing 20 ml of oxygen
Diesel oil	—	1.75	0.18	10	180
The same + admixture АЗННН-7	5	1.75	0.50	7	251
Diesel oil + admixture АЗННН-7 and АЗННН-10	5 + 0.5	1.26	0.08	10	293
Diesel oil + admixture СБ-3	10	3.99	0.29	9	87
The same + admixture АЗННН-10	10 + 0.5	1.65		7	243
Diesel oil + admixture АЗННН-10	0.1	—	—	15	262
	0.5	—	—	18	260
	1.0	—	—	15	247

Table 4. Studying the Effect of АЗННН-10 Admixture on Stability and Corrosion-Ability of Synthetic Oil

Name of product	Acid number, mg KOH		Residue %	Corrosion	
	before testing	after testing		g/m <sup>2</sup>	outer form of plates
Synthetic oil	0.56	6.9	0.04	-8.8	corrosion
The same + 1% admixture АЗННН-10	0.94	5.1	0.04	0	no corrosion

The above given data allow to indicate, that an AzNII-10 admixture appears to be an effective admixture, having the ability of raising stability, anticorrosion, antiscale and antiwear properties of oils.

Positive results were obtained when testing synthetic oil in a mixture with AzNII-10 admixture. In this case it was noticed, that the AzNII-10 admixture exerts a favorable effect on antiscale properties of the oil.

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